Taxon: Ardisia solanacea Roxb. **Family:** Myrsinaceae

Common Name(s): China shrub; shoebutton ardisia **Synonym(s):** Ardisia humilis auct.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 6 Mar 2020

WRA Score: 7.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Naturalized, Shrubby Tree, Shade tolerant, Fleshy-fruited, Bird-dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence] "Mixed forests, shrubby areas, mountains or hillsides; 400–1600 m. SW Guangxi, S and SE Yunnan [India, Nepal, Singapore, Sri Lanka, cultivated in Hawaii]."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	NA

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	Woodson, Jr., R.E., Schery, R.W. & Lundell, C.L. (1971). Flora of Panama. Part VIII. Family 150. Myrsinaceae. Annals of the Missouri Botanical Garden 58(3): 285-353	"Native to India, Malaya, and China; naturalized and cultivated in the American tropics."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 5 Mar 2020]	"Native Asia-Temperate CHINA: China [Yunnan Sheng (s.e. & s.-c.), Guangxi Zhuangzu Zizhiqu (s.w.)] Asia-Tropical INDIAN SUBCONTINENT: Bhutan, India, Nepal, Sri Lanka INDO-CHINA: Myanmar MALESIA: Malaysia, Singapore"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Woodson, Jr., R.E., Schery, R.W. & Lundell, C.L. (1971). Flora of Panama. Part VIII. Family 150. Myrsinaceae. Annals of the Missouri Botanical Garden 58(3): 285-353	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Mixed forests, shrubby areas, mountains or hillsides; 400–1600 m" [Environmental versatility - elevation range exceeds 1000 m]

Qsn #	Question	Answer
204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Woodson, Jr., R.E., Schery, R.W. & Lundell, C.L. (1971). Flora of Panama. Part VIII. Family 150. Myrsinaceae. Annals of the Missouri Botanical Garden 58(3): 285-353	"Native to India, Malaya, and China; naturalized and cultivated in the American tropics."

205	**Does the species have a history of repeated introductions outside its natural range?**	**y**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"400–1600 m. SW Guangxi, S and SE Yunnan [India, Nepal, Singapore, Sri Lanka, cultivated in Hawaii]."

301	**Naturalized beyond native range**	**y**
	Source(s)	**Notes**
	Nelson, G. 2010. The Trees of Florida. A Reference and Field Guide. 2nd Edition. Pineapple Press Inc, Sarasota, FL	"Ardisia solanacea" … "Distinguishing Marks: Most similar to shoebutton ardisia (A. elliptica), distinguished (not with some difficulty) by the flowers of shoebutton ardisia being borne in umbels. Distribution: Disturbed sites; rarely escaped, reported naturalized only from Hillsborough County."
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	"Introduced and naturalized in many areas in Puerto Rico, at lower elevations; a native to S.E. Asia, now widespread in cultivation and naturalized in the tropical countries."
	Woodson, Jr., R.E., Schery, R.W. & Lundell, C.L. (1971). Flora of Panama. Part VIII. Family 150. Myrsinaceae. Annals of the Missouri Botanical Garden 58(3): 285-353	"Native to India, Malaya, and China; naturalized and cultivated in the American tropics"
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence in the Hawaiian Islands to date

302	**Garden/amenity/disturbance weed**	**y**
	Source(s)	**Notes**
	Tropics Management Authority. (2004). Wet Tropics Conservation Strategy: the conservation, rehabilitation and transmission to future generations of the Wet Tropics World Heritage Area. WTMA, Cairns, Australia	"High priority weeds - new infestations to be eradicated and larger, established outbreaks to be contained" … "Ardisia solanacea" … "Recent invader from domestic gardens around Cairns" [Targeted for control, but insufficient documentation of impacts at this point to designate this species as an environmental weed]

303	**Agricultural/forestry/horticultural weed**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Multiple references list Ardisia solanacea as a weed, but only as a synonym for Ardisia elliptica

304	**Environmental weed**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Cited as a weed, but insufficient evidence to designate as an environmental weed] "References: Puerto Rico-CW-261, southeast Asia-W-191, Australia-CN-368, Caribbean-N-707, Pacific-W-3, Global-N-85, United States of America-N-101, Jamaica-I-986, Australia-W-1210, Caribbean-NI-1201, Global-W-1376, Global-I-1404, Global-CD-1611, Eastern Caribbean-N-1742, United States of America-N-742, Mascarene islands-N-2049, Australia-W-1977."
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	Multiple references list Ardisia solanacea as a weed, but only as a synonym for Ardisia elliptica

305	Congeneric weed	y
	Source(s)	**Notes**
	Kitajima, K., Fox, A. M., Sato, T., & Nagamatsu, D. (2006). Cultivar selection prior to introduction may increase invasiveness: evidence from Ardisia crenata. Biological Invasions, 8(7), 1471-1482	[Ardisia crenata] "Where invasive, it becomes dominant in the understorey and forms dense stands…". Ardisia elliptica: "The shrub is shade-tolerant and forms dense monotypic stands…"
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Ardisia elliptica] The shrub is invasive because it forms dense single-species stands, preventing establishment and regeneration of all other species due to the dense foliage casting shade. In Florida, it invades disturbed wetlands and tree islands in the Everglades, as well as cypress and mangrove swamps (Langeland and Craddock Burks, 1998). In Jamaica, the shrub forms extensive secondary thickets (Langeland and Craddock Burks, 1998). In parts of the Northern Territory, Australia, shoe-button ardisia has become established in monsoon vine forests and melaleuca woodlands (State of Queensland, 2014). The shrub prolifically produces seeds, and seedlings can cover almost 100% of the forest floor."

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Shrubs or trees to 6 m tall, glabrous. Branchlets prominently angular, 5–7 mm in diam."

402	Allelopathic	
	Source(s)	**Notes**
	Fujii, Y., Parvez, S. S., Parvez, M., Ohmae, Y., & Iida, O. 2003. Screening of 239 medicinal plant species for allelopathic activity using the sandwich method. Weed Biology and Management, 3(4): 233-241	[Unknown] "Table 1. Screening of leaf litter of 239 medicinal plant species under different families using the sandwich method" [Unknown for A. solanacea. A related species, Ardisia lurida, did not have statistically significant inhibitory effects in laboratory trials]

Qsn #	Question	Answer
403	**Parasitic**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Shrubs or trees to 6 m tall, glabrous. Branchlets prominently angular, 5–7 mm in diam." [Myrsinaceae]

404	Unpalatable to grazing animals	
	Source(s)	**Notes**
	Prince Rainer III & Bourne, G.H. (1977). Primate Conservation. Academic Press, New York	"Table III. Plant Species Used for Food by the Red Uakaris in the Seminatural Environment" [Ardisia solanacea Leaves, Buds Flowers are Fruits are consumed. Unknown if these would also be palatable to browsing animals]

405	Toxic to animals	n
	Source(s)	**Notes**
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"tender leaves as vegetable" [No evidence]
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence in genus

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Unknown

Qsn #	Question	Answer
407	**Causes allergies or is otherwise toxic to humans**	**n**
	Source(s)	**Notes**
	Venu, P. (1999). Environmental Impact Assessment: Some Considerations on Evaluation of Flora - An Overview. PINSA 865(5): 257-274	"Food and drinks: Access to a wide variety of edible forest products .results in diverse diet in rural societies. Edible tubers, rhizomes, leaves, fruits, seeds from nearby forests in different seasons supplement food requirements." … "young leaves of Aerva lanata, AmpeZocissus latifolia, Ardisia solanacea,…"
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"tender leaves as vegetable" [No evidence. Also used medicinally in a number of traditional remedies]
	Rajesh, K., Singh Manish, K., & Avinash, B. K. (2013). Ethnobotany of Tharus of Dudhwa National Park, India. Mintage Journal of Pharmaceutical and Medical Science, 2 (1), 6-11	"The ripen fruits are edible." [No evidence]
	Hu, Shiu-ying. 2005. Food Plants of China. Chinese University Press, Hong Kong	[No evidence] "Ardisia solanacea" … "Tender leafy shoots; parboiled, washed, drained, and seasoned for salad, a favorite of the Thai living in southern Yunnan."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**
	Tropicos.org. (2013). Flora of Pakistan - Ardisia solanacea. Missouri Botanical Garden. http://www.tropicos.org/Name/22000008. [Accessed 21 Jun 2013]	"Distribution: A native of moist ravines and forests almost throughout India." [No evidence. Unlikely in moist habitats]

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	**Notes**
	Reddy, C. S., & Pattanaik, C. (2009). An assessment of floristic diversity of Gandhamardan hill range, Orissa, India. Bangladesh Journal of Plant Taxonomy, 16(1), 29-36	[Presumably Yes. Grows under dense forest canopy] "Some of the shrubs e.g., Ardisia solanacea Roxb., Flemingia macrophylla (Willd.) Prain ex Merr., Indigofera cassioides Rottl. ex DC., Leea asiatica (L.) Ridsdale and Morinda citrifolia L., were found to grow in dense and interior forests."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	**Notes**
	Tropical Plants Database, Ken Fern. (2020). Ardisia solanacea. http://tropical.theferns.info/viewtropical.php?id=Ardisia+solanacea. [Accessed 5 Mar 2020]	"Prefers a well-drained, moisture-retentive, humus-rich soil in a partially shaded position" [Unknown]

Qsn #	Question	Answer
411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Shrubs or trees to 6 m tall, glabrous. Branchlets prominently angular, 5–7 mm in diam."

412	Forms dense thickets	
	Source(s)	**Notes**
	Nelson, G. 2010. The Trees of Florida. A Reference and Field Guide. 2nd Edition. Pineapple Press Inc, Sarasota, FL	[No evidence to date] "Distribution: Disturbed sites; rarely escaped, reported naturalized only from Hillsborough County."
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	[No specific evidence] "Introduced and naturalized in many areas in Puerto Rico, at lower elevations..."
	Benthall, A.P. (1946). The Trees of Calcutta and its Neighbourhood. Thacker Spink & Co., Calcutta	[Possibly Yes] "Near Calcutta it is often found in thickets and village shrubberies, especially south of the city. It often flowers when only a small bush and sometimes forms a dense undergrowth in clearings and waste places."

501	Aquatic	n
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Terrestrial] "Mixed forests, shrubby areas, mountains or hillsides; 400–1600 m."

502	Grass	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 6 Mar 2020]	Family: Primulaceae Subfamily: Myrsinoideae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 6 Mar 2020]	Family: Primulaceae Subfamily: Myrsinoideae

Qsn #	Question	Answer
504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Shrubs or trees to 6 m tall, glabrous. Branchlets prominently angular, 5–7 mm in diam."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence] "Mixed forests, shrubby areas, mountains or hillsides; 400–1600 m. SW Guangxi, S and SE Yunnan [India, Nepal, Singapore, Sri Lanka, cultivated in Hawaii]."
	Benthall, A.P. (1946). The Trees of Calcutta and its Neighbourhood. Thacker Spink & Co., Calcutta	[No evidence] "This little tree is common throughout most of India, chiefly 0n the banks of streams. Near Calcutta it is often found in thickets and village shrubberies, especially south of the city."

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Zhao, J., Chen, J., & Ma, S. (2008). Seed predation and dispersal of Ardisia solanacea in habitats with different degree of disturbance. Biodiversity Science, 16(1), 34-43	"Abstract : Effective dispersal is one essential course for invasive species on their process of invasion, while study on the effectiveness of seed dispersal was often neglected when predicting species' invasion. Native to Tropical Asia, Ardisia elliptica is an invasive species in North America. A. solanacea is a tree naturally distributed in southern Yunnan with biological characteristics similar to A. elliptica. In this study, we conducted observation on seed dispersal and seed predation of A. solanacea in two habitats with different degree of disturbance: the Wild Elephant Valley (WEV) with few disturbances and the Xishuangbanna Tropical Botanical Garden (XTBG) with high disturbances. The aim of the study was to understand how disturbances affect seed dispersal and seed predation of A. solanacea. In both habitats, three frugivorous birds were the main seed dispersers, i.e., Alophoixus pallidus, Pycnonotus melanicterus and Iole propinqua. However, the visiting frequency and feeding behavior differed in the two habitats. In WEV, the visiting frequency of the three birds was 25%, 32% and 26%, respectively; while in XTBG, it was 67%, 8% and 5%, respectively. Only 4% of the birds got first stop far than 10 m away from the fruiting tree after feeding in WEV, but 26% in XTBG. Seed placement experiment indicated that rodents were the major predators to the seeds on ground. The predation rate in both habitats were rather low (2-6%) while seed predation rate in WEV was significantly higher than that in XTBG. In WEV, larvae of Curculionidae were another seed predator, which caused 17.9±3.5% (n=512) of seeds parasitized. In contrast, no seeds was found to be parasitized by the larvae (n=489) in XTBG. Disturbance significantly affect the composition and behaviour of animals inhabited. Consequently, those changes may influence seed dispersal and seed predation of related plants, and indirectly, affect the population recruitment of plants."

Qsn #	Question	Answer
	Lemke, C. (2001). Cal's plant of the week - Ardisia solanacea. September 21-27. http://www.plantoftheweek.org/week144.shtml. [Accessed 6 Mar 2020]	"Propagation: Ardisia solanacea are propagated by cuttings of half matured wood with a bottom heat of 72° F. or by seed sown in late winter or early spring. Seed germinate in 14 - 28 days at 70° F. "

603	Hybridizes naturally	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	
	Source(s)	**Notes**
	Pascarella, J. B. (1997). Breeding systems of Ardisia Sw (Myrsinaceae). Brittonia, 49(1), 45-53	[Unknown for A. solanacea. Related species are self-compatible] "Five species (A. escallonioides Schldl. & Cham., A. hirtella Lundell, A. elliptica Thunb., A. sieboldii Miq., and A. wallichii A. DC.) from three subgenera in the genus Ardisia (Myrsinaceae) were examined for self compatibility, agamospermy, and autogamy using hand-pollination and pollinator exclusion experiments on both garden plants and wild populations. All five species are self compatible but not agamospermous."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[No evidence based on floral morphology] "Flowers leathery, pink, ca. 1 cm. Sepals broadly ovate to reniform, ca. 3 mm, densely black punctate, base subauriculate, margin subentire or crenulate, ciliate, scarious, apex rounded. Petals nearly free; lobes broadly ovate, ca. 9 mm, punctate, margin entire, hyaline, apex obtuse or acute. Stamens subequalling petals; filaments ca. 1/4 anther length; anthers linear-lanceolate, densely punctate dorsally, longitudinally dehiscent, apex acute. Pistil subequalling petals; ovary globose, densely punctate; ovules numerous, multiseriate."
	Zomlefer, W.B. 1994. Guide to Flowering Plant Families. The University of North Carolina Press, Chapel Hill & London	[No evidence] "Little has been reported on the pollination biology of the flowers of the family, which are entomophilous."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	Lemke, C. (2001). Cal's plant of the week - Ardisia solanacea. September 21-27. http://www.plantoftheweek.org/week144.shtml. [Accessed 6 Mar 2020]	"Propagation: Ardisia solanacea are propagated by cuttings of half matured wood with a bottom heat of 72° F. or by seed sown in late winter or early spring. Seed germinate in 14 - 28 days at 70° F." [No evidence of vegetative spread]

Qsn #	Question	Answer
607	**Minimum generative time (years)**	**3**
	Source(s)	**Notes**
	Benthall, A.P. (1946). The Trees of Calcutta and its Neighbourhood. Thacker Spink & Co., Calcutta	[Probably between 2-4 years] "It often flowers when only a small bush and sometimes forms a dense undergrowth in clearings and waste places."

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fruit purplish red or blackish, oblate, 7–9 mm in diam., densely black punctate." [No evidence, and seeds lack means of external attachment]

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Oakman, H.1995. Harry Oakman's what flowers when: the complete guide to flowering times in tropical and subtropical gardens. Univ. of Queensland Press, St. Lucia, Australia	"Hardy in sun or semi-shade; raised from seed or tip cuttings; origin is Malaysia." [Cultivated as an ornamental]
	Tropicos.org. (2013). Flora of Pakistan - Ardisia solanacea. Missouri Botanical Garden. http://www.tropicos.org/Name/22000008. [Accessed]	"Sometimes cultivated in gardens for its evergreen habit and showy pink flowers."

703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fruit purplish red or blackish, oblate, 7–9 mm in diam., densely black punctate." [No evidence, and unlikely vector of spread]

704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fruit purplish red or blackish, oblate, 7–9 mm in diam., densely black punctate"

705	**Propagules water dispersed**	
	Source(s)	**Notes**
	Benthall, A.P. (1946). The Trees of Calcutta and its Neighbourhood. Thacker Spink & Co., Calcutta	"This little tree is common throughout most of India, chiefly on the banks of streams." [Seeds possibly moved by water and distributed along streams]

706	**Propagules bird dispersed**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Zhao, J., Chen, J., & Ma, S. (2008). Seed predation and dispersal of Ardisia solanacea in habitats with different degree of disturbance. Biodiversity Science, 16(1), 34-43	"Effective dispersal is one essential course for invasive species on their process of invasion, while study on the effectiveness of seed dispersal was often neglected when predicting species' invasion. Native to Tropical Asia, Ardisia elliptica is an invasive species in North America. A. solanacea is a tree naturally distributed in southern Yunnan with biological characteristics similar to A. elliptica. In this study, we conducted observation on seed dispersal and seed predation of A. solanacea in two habitats with different degree of disturbance: the Wild Elephant Valley (WEV) with few disturbances and the Xishuangbanna Tropical Botanical Garden (XTBG) with high disturbances. The aim of the study was to understand how disturbances affect seed dispersal and seed predation of A. solanacea. In both habitats, three frugivorous birds were the main seed dispersers, i.e., Alophoixus pallidus, Pycnonotus melanicterus and Iole propinqua. However, the visiting frequency and feeding behaviour differed in the two habitats."
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fruit purplish red or blackish, oblate, 7–9 mm in diam., densely black punctate"
	Puyravaud, J. P., Dufour, C., & Aravajy, S. (2003). Rain forest expansion mediated by successional processes in vegetation thickets in the Western Ghats of India. Journal of Biogeography, 3 (7), 1067-1080	"Table 1 Species characteristics" … "Ardisia solanacea" … "Dispersal agent - Birds"

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fruit purplish red or blackish, oblate, 7–9 mm in diam., densely black punctate" [Fruits and seeds lack means of external attachment]

708	Propagules survive passage through the gut	y
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fruit purplish red or blackish, oblate, 7–9 mm in diam., densely black punctate"
	Zhao, J., Chen, J., & Ma, S. (2008). Seed predation and dispersal of Ardisia solanacea in habitats with different degree of disturbance. Biodiversity Science, 16(1), 34-43	"The aim of the study was to understand how disturbances affect seed dispersal and seed predation of A. solanacea. In both habitats, three frugivorous birds were the main seed dispersers, i.e., Alophoixus pallidus, Pycnonotus melanicterus and Iole propinqua. However, the visiting frequency and feeding behaviour differed in the two habitats. In WEV, the visiting frequency of the three birds was 25%, 32% and 26%, respectively; while in XTBG, it was 67%, 8% and 5%, respectively. Only 4% of the birds got first stop far than 10 m away from the fruiting tree after feeding in WEV, but 26% in XTBG."

801	Prolific seed production (>1000/m2)	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, eds. 1996. Flora of China. Vol. 15 (Myrsinaceae through Loganiaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Fruit drupaceous, 1-seeded…" [Genus description] "Shrubs or trees to 6 m tall, glabrous." … "Fruit purplish red or blackish, oblate, 7–9 mm in diam., densely black punctate." [Relatively small trees with single-seeded fruit unlikely to produce such high seed densities]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	**Notes**
	Pascarella, J. B., Horvitz, C. C., & Valdosta, G. (1999). Seed and seedling ecology of the invasive non-indigenous shrub Ardisia elliptica Thunb.(Myrsinaceae) in South Florida. In Proceedings of the Twenty Fifth Annual Conference on Ecosystems Restoration and Creation. Hillsborough Community College, Tampa, Florida	"Ardisia elliptica" … "Fresh seeds were highly viable (77- 100%). However, seed viability declined with storage greater than two months. There was no evidence of a long-term seed bank." [Probably no based on seed storage of closely related species Ardisia elliptica]

803	Well controlled by herbicides	
	Source(s)	**Notes**
	Sellers, B.A., Langeland, K.A., Ferrell, J.A., Meisenberg, M. & Walter, J. (2007). Identification and Control of Coral Ardisia (Ardisia crenata): A Potentially Poisonous Plant. SS AGR 276. University of Florida IFAS, Gainesville, FL.	[Possibly. Herbicides are used effectively on Ardisia crenata] "Control of coral ardisia can be accomplished by two methods. Low-volume foliar applications of 5% v/v of Garlon 4 or Remedy provides suppression of this plant, but complete foliar coverage is essential. Basal bark applications with an 18% v/v solution of Garlon 4 or Remedy in an oil carrier can also be utilized for suppressing this invasive weed."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Unknown

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	n
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	Given the abundance of Ardisia elliptica and A. crenata in the Hawaiian Islands, presumably no serious pests or pathogens of Ardisia are present in the Hawaiian Islands

Summary of Risk Traits:

High Risk
• Elevation range exceeds 1000 m
• Naturalized in Puerto Rico, Florida and elsewhere (but no evidence in the Hawaiian Islands to date)
• Targeted for control in Queensland, Australia
• Other Ardisia species have become invasive
• Relatively unpalatable
• Shade tolerant
• Seeds dispersed by birds and possibly other frugivorous animals

Low Risk
• Unarmed (no spines, thorns or burrs)
• Non-toxic
• Edible fruit
• Valued as a landscaping and ornamental value
• Seeds unlikely to form a persistent seed bank